

Free-Floating Ball and Socket Memristor for Self-Optimizing Neuromorphic Processing Function

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Introduction

Although there are many tangible benefits to neuromorphic computing, neuromorphic computing as it is currently manifest does not employ anywhere near the full range of processing capacities of the human brain. The human brain employs a variety of methods for enhancing function including axonal variation (selecting different pathways,) voltage variation (to make depth selection for memory access,) signal direction inversion, pattern sequence inversion (white matter,) variation of neuronal response latency via salinity control at the cellular level and, most likely, many other unrecognized methods.

Thus, as we attempt to reap the maximal benefit from future neuromorphic designs, we ought to use maximize what is termed hardware-acceleration. The use of memristors, in and of itself, is a major stride in this direction as memristors employ and have as their chief strength the close collocation of stored memory with processing media.

Abstract

Extant neuromorphic systems employ pre-manufactured axonal pathways which are fixed at the time of manufacture. Whereas the human brain can project signals along virtually any number of combination of circuitous pathways connecting two points, artificial neuromorphic systems are isomorphic and non-dynamical, at least as they've thus far been conceived. Also absent from today's neuromorphic systems is the ability to project signals through both induction (near-light-speed) and through quantum entanglements (truly instantaneous.) Although the quantum interconnection/entanglement of distant brain regions aspect of human neurology may eventually be artificially duplicated, delineating how best to do this is not the focus of this abstract. Ibid. previous publication concerning using room-temperature BECs in computing.

Enhanced artificial neuromorphic function may be achieved by creating three-dimensional processing spaces reminiscent of the cerebrum in which the material of which the artificial cerebrum is composed is capable of conducting current in an infinite variety of directions rather than featuring pre-defined pathways for conducting voltage. This material would be doped with specialized memristors which double as electromagnetic transducers. Computational results will naturally vary depending upon which precise combination of memristors are accessed and in which sequence. Response times of an artificial memristor can be dynamically modulated through the incorporation of the ingredient of phononic generation with the memristor itself (prompted by current being

passed through the specialized memristor) being the point of origin for phononic energy. The presence of unpredictable amounts of phononic energy could be predicted to enhance memristor response times variably depending upon phononic activity. The much slower-than-light travel of the phonons would result in a desirable randomizing effect on memristor behavior which could be predicted to aid cognition.

More critically, these memristors would be perfectly spherical and would reside within a ball-and-socket mechanism, able to freely float and change their orientation within the unit without resistance. The physical orientation of each *floating memristor* would determine the direction in which electrical current is projected and would thus dictate the combination of subsequent memristors accessed. This approach could be predicted to powerfully multiply computational output for reason that when computational work of a fruitful nature is being achieved by a particular combination of memristors, the increased current associated with increased workloads could be predicted to hold the memristor network in largely the same configuration through simple magnetism. As the needed insights are sapped from that particular network, the needed work in subsequent cycles could be predicted to decrease over time, reducing the extent of the magnetic polarization of the nodes. With reduced polarization, the free-floating memristors would naturally begin to drift. In this way, the system could physically self-generate the desired behavior of signal redirection toward different memristors when old ones cease to bear computational fruit. No outside intervention would be required to achieve this end as the artificial cerebrum, itself, would dynamically change the employed axons in response to decreased electrical throughput in specific areas.

In this way, the artificial cerebrum with its floating memristors would have the twin properties of both *trainability* and *plasticity*. Such a processor would far-outperform any other neuromorphic system and would likely outperform binary systems when performing certain tasks. Ideally, such a system would also incorporate the human cerebrum's ability to inform itself of which choices will lead to fruitful results on a precognitive basis; something which could be readily duplicated. The perfected mind is the one which is able to instantaneously achieve a desired result by dint of its intrinsic capacity to eventually reach the same result. The ingredients needed for the such a perfected mind have always been maximal diversity of neural structures and functions coupled with precognitive feedback regarding which approaches are likely to succeed. As this proposed approach prevents stagnation of thought and maximizes dynamism, it has the capacity to enable levels of cognitive capacity which exceed that of a human being as the human cerebrum does not feature moving structures excepting fluids and ion transport.

Whereas the human cerebrum relies upon the transport of ions to vary axonal selection and to vary both voltage and amperage of signals, this artificial cerebrum would use a single voltage and amperage of current but would permit changes to the rotational orientation of the spherical memristors in their sockets in order to enable dynamism of axon selection which is self-generated.

The conductive medium ought to be composed of a material which results in a slightly spread-focus of projected electrical energy which ensures that at least one memristor is consistently reached by any projected electrical energy, but which also makes it likely that two or more may be reached by the same signal.

Conclusion

This novel type of memristor-based processor should provide a unique capability not previously available and this, therefore, recommends it for development.